(c) Dispersion in ground

There are scientifically valid reasons to believe that the chemical and physical properties of DU make it more liable to dispersion in soil than is the case for natural uranium. The issue of DU dispersion into the ground is of particular relevance in judging the risk of future groundwater contamination and, ultimately, drinking water supplies (see Appendix E for further details).

Soil profiles collected from Han Pijesak revealed limited dispersion of DU into the ground

The depth of contaminated soil caused by dispersion of DU below contamination points or a penetrator was carefully studied. The major part of soil contamination was found in the upper 0-10 cm and the concentration then fell by 1-2 orders of magnitude for each 10 cm further below. These results were similar to the ones from the UNEP DU mission to Kosovo in 2000, however, the depth of detectable dispersion had increased from 10 to 40 cm during the five additional years of dispersion as compared to the Kosovo findings. Importantly, the major part of measured activity (~98 per cent) remained in the upper 10 cm. This vertical distribution results from dissolution and dispersion of DU from the initial superficial contamination (or from the penetrator lying on the surface). When comparing results with Kosovo, it should be noted that soil conditions at the investigated sites might be different from these in Kosovo.

(d) Penetrators

As outlined in Chapter 2.3, and discussed in more detail in Appendix H '*Analysis of DU Penetrators, Fragments and Jackets*', the fate of a DU penetrator after firing is governed by a wide range of variable factors (e.g. type of target, resistance of surface substrate, etc). Consequently, there are several possible explanations of why penetrators were found at some sites but not at others.

Altogether at the three sites where DU was discovered, some ten penetrators, two jackets and several dozen fragments were found. The presence of a further 100 penetrators hidden in the ground were indicated by measurements. In most cases, the penetrators were located either on the ground surface, or superficially covered by leaves and grass. Those that were covered by less than 10 cm of soil were heavily corroded and, given a similar continued rate of

An intact penetrator still in its jacket

corrosion, would disappear as solid objects from the environment within 25-35 years after impact into the ground. The penetrators that were lying on the ground surface were only mildly corroded. What occurs in the case of penetrators hidden deep in the ground has not yet been studied by UNEP and is an important unanswered scientific question.

Most penetrators that were found on the surface or just below were picked up, but some of them were left *in situ*, as mentioned in Chapter 7 '*Site-specific findings*'. These sites therefore have to be searched and possible penetrators and contaminated soil dealt with.

A penetrator cleaned from soil and DU corrosion products shows structural damage

As described above, the soil underneath and around penetrators on the ground surface was contaminated by DU. This finding is closely related to the corrosion of penetrators, which also illustrates one possible pathway for internal exposure. If a person not wearing protective gloves touches a corroded penetrator, hands may become contaminated, leading to a risk of DU ingestion.

Due to the lack of widespread contamination, there are good reasons to believe that most of the DU rounds that were fired at the sites investigated did not fragment, but instead entered the ground more or less intact. In this way, they are a source of uranium that might influence the uranium concentration in drinking water in the future. Exceptionally, the amount of additional uranium in the affected areas might be 10-100 times naturally occurring levels. However, the additional amount would normally only represent a doubling of natural uranium levels.

Penetrators were also analysed with regard to their plutonium content (Pu-239/240), uranium-236 (U-236) and neptunium (Np-237) (see Appendix H). The isotopic composition and radiochemical analysis confirmed the overall picture for penetrators and fragments that emerged from the UNEP DU missions to Kosovo, and Serbia and Montenegro. The depletion level in all samples measured was constant (i.e. 0.200±0.001% U-235 by weight). In addition, the level of U-236 in penetrators was confirmed to be 0.0028 per cent by weight.